

CLAIMS

- 1 1. An antenna structure comprising:
- 2
- 3 at least one antenna element, the at least one antenna element having at
- 4 least one taper; and
- 5
- 6 a symmetrical ground plane coupled with the at least one antenna
- 7 element.
- 1 2. The antenna structure of Claim 1, wherein the at least one antenna
- 2 element comprises a travelling wave antenna supporting a phase velocity
- 3 greater than the speed of light.
- 1 3. The antenna structure of Claim 1, wherein the taper comprises a linear
- 2 profile, a linear constant profile, a broken-linear profile, an exponential profile,
- 3 an exponential constant profile, a tangential profile, a step-constant profile, or a
- 4 parabolic profile.
- 1 4. The antenna structure of Claim 1, wherein the antenna structure supports
- 2 a cigar-like directional three-dimensional beam pattern and a butterfly wing-
- 3 like directional three- dimensional beam pattern.

1 **5.** The antenna structure of Claim 1, wherein the at least one antenna
2 element is positioned at an angle from the symmetrical ground plane.

1 **6.** The antenna structure of Claim 5, wherein the angle is about 90 degree
2 with respect to the *x*-, *y*- and *z*- axes.

1 **7.** The antenna structure of Claim 1, wherein the at least one antenna
2 element is coupled with the symmetrical ground plane by means of an
3 unbalanced impedance.

1 **8.** The antenna structure of Claim 7, wherein the unbalanced impedance
2 comprises a coaxial cable.

1 **9.** The antenna structure of Claim 7, wherein a first conductor of the
2 unbalanced impedance mechanically couples the at least one antenna element
3 with the symmetrical ground plane.

1 **10.** The antenna structure of Claim 1, wherein the symmetrical ground plane
2 is disk shaped.

1 **11.** An antenna structure comprising:

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3 an array of at least two antenna elements, each antenna element having
4 at least one taper;

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6 a symmetrical ground plane; and

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8 an unbalanced impedance for coupling the array of at least two antenna
9 elements with the symmetrical ground plane.

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1 **12.** The antenna structure of Claim 11, wherein at least one antenna element
2 of the array comprises a travelling wave antenna supporting a phase velocity
3 greater than the speed of light.

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1 **13.** The antenna structure of Claim 11, wherein the taper of at least one
2 antenna element of the array comprises a linear profile, a linear constant
3 profile, a broken-linear profile, an exponential profile, an exponential constant
4 profile, a tangential profile, a step-constant profile, or a parabolic profile.

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1 **14.** The antenna structure of Claim 11, wherein each antenna element of the
2 array supports a cigar-like directional three-dimensional beam pattern and a
3 butterfly wing-like directional three-dimensional beam pattern.

1 **15.** The antenna structure of Claim 11, wherein each antenna element of the
2 array is positioned at an angle from the symmetrical ground plane.

1 **16.** The antenna structure of Claim 15, wherein the angle for each antenna
2 element is about 90 degree with respect to the x-, y- and z- axes.

1 **17.** The antenna structure of Claim 11, wherein the unbalanced impedance
2 comprises a coaxial cable.

1 **18.** The antenna structure of Claim 17, wherein a first conductor of the
2 unbalanced impedance mechanically couples each antenna element of the array
3 with the symmetrical ground plane.

1 **19.** The antenna structure of Claim 11, wherein the symmetrical ground
2 plane is disk shaped.

1 **20.** The antenna structure of Claim 11, further comprising a slow wave
2 antenna to widen the directivity of the antenna structure.

1 **21.** An apparatus comprising:

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3 a transceiver; and

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5 an antenna structure for radiating or capturing electromagnetic energy
6 from or to the transceiver comprising:

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8 at least one antenna element having at least one taper, the taper
9 comprising a linear profile, a linear constant profile, a broken-
10 linear profile, an exponential profile, an exponential constant
11 profile, a tangential profile, a step-constant profile, or a parabolic
12 profile;

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14 a symmetrical disk shaped ground plane, the at least one antenna
15 element being positioned at an angle from the symmetrical disk
16 shaped ground plane; and

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18 an unbalanced impedance for coupling the at least one antenna
19 element with the symmetrical disk shaped ground plane.

1 **22.** The apparatus of Claim 21, wherein the at least one antenna element
2 supports a cigar-like directional three-dimensional beam pattern and a butterfly
3 wing-like directional three-dimensional beam pattern.

1 **23.** The antenna structure of Claim 21, wherein the angle is about 90 degree
2 with respect to the x-, y- and z- axes.

- 1 **24.** The antenna structure of Claim **21**, wherein the unbalanced impedance
 - 2 comprises a coaxial cable.
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- 1 **25.** The antenna structure of Claim **21**, wherein a first conductor of the
 - 2 unbalanced impedance mechanically couples the at least one antenna element
 - 3 with the symmetrical ground plane.